Washington State Department of Transportation

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Improving Highway Safety:
Rumble Strips

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Center Line Rumble Strips

Rural two-lane roads generally lack physical measures such as wide medians or barriers to separate opposing traffic flows. As a result, a major crash problem on these roads involves vehicles crossing the center line and either sideswiping or striking the front ends of opposing vehicles. These types of opposing-direction crashes account for about 20 percent of all fatal crashes on rural two-lane roads.

Research has shown that center line rumble strips can reduce the rate of injury collisions on two-lane roads by 15%.[1]

Approximately 75 miles of center line rumble strips were installed as test areas in Washington State. For the one location that has been in place long enough to evaluate, WSDOT has experienced a 52% reduction in crossover collisions.[2]

A preliminary analysis of center line crossover crashes throughout Washington State on rural two-lane roads indicates 15 lives annually could be saved through an aggressive policy for installation of center line rumble strips.

A total of 110 miles of center line rumble strips have now been installed in Washington State.

[1] (Insurance Institute, 2003).

[2] (Gray Notebook, WSDOT June 2004)

Center Line Rumble Strip Costs

Center line rumble strips can be installed for about $2,000 per mile.*

Rumble strips require minimal maintenance and would be replaced with the paving cycle.

This low-cost measure to reduce crossover collisions results in a benefit-cost ratio of about 60:1.

*Based on nationwide average costs.

WSDOT is implementing a number of other safety initiatives:

- median protection on divided highways (protection from crossover occurrances)
- new guardrail installation (protection from slopes and fixed objects)
- replacement of non-standard or obsolete guardrail

Look for additional folios on these subjects in the future!

Published Folios

Improving Highway Safety: Cable Median Barriers
January 2004

Rumble strips are grooves or rows of raised pavement markers placed perpendicular to the direction of travel to alert inattentive drivers. Drivers passing over the rumble strips are alerted by the noise and vibration produced.

Rumble strips are particularly effective in reducing crashes attributed to driver inattention.

Studies have shown that rumble strips can reduce the frequency of lane departure crashes by 20% to 50%. The Federal Highway Administration (FHWA) reports that about one-third of the country's traffic fatalities are caused by single vehicle run-off-the-road crashes. Consequently, rumble strips are being implemented as a safety initiative on Washington's highways.

Bicyclists have expressed concern over the application of rumble strips on highway shoulders. The Washington State Department of Transportation's (WSDOT) policy on shoulder rumble strips was developed with active participation of bicycle representatives, to ensure their concerns were addressed.

> ***"…I like them. I was sleeping one time. The ground was really uneven so I woke up. It was then realized I was sleeping on the freeway. Way to go RUMBLE STRIPS!!!!"***
>
> —Posting on WSDOT website, October 2001.

WSDOT uses three types of rumble strips as a matter of policy.

Shoulder Rumble Strips
- placed on the shoulders just beyond the traveled way to warn drivers they are entering a part of the roadway not intended for routine traffic use.

Center Line Rumble Strips
- placed on center line of undivided highways to warn drivers they are leaving their intended lane of travel.

Roadway Rumble Strips (used infrequently)
- placed across the traveled way to alert drivers approaching a change of roadway condition or a hazard that requires substantial speed reduction or other maneuvering.

Washington State Department of Transportation

Rumble Strips

Shoulder Rumble Strips – Divided Highways

Although 18 percent of all crashes are single vehicle run-off-the-road crashes, they account for 30% of all the fatal crashes on Washington State highways, and 37% of the fatals on divided highways. In an effort to reduce these fatalities, shoulder rumble strips are used to alert drivers that they have left their intended lane of travel.

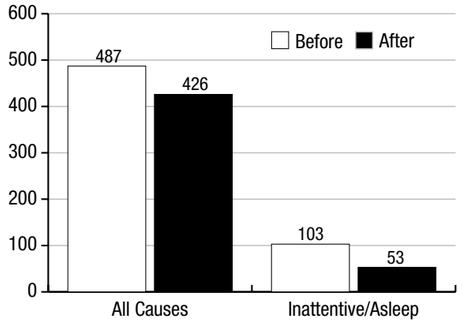
WSDOT policy, implemented in 1997, requires shoulder rumble strips on both the left and the right shoulders of rural interstate highways.

Rural Interstate Miles	498.75
Miles Completed	430.71
% Completed	86%

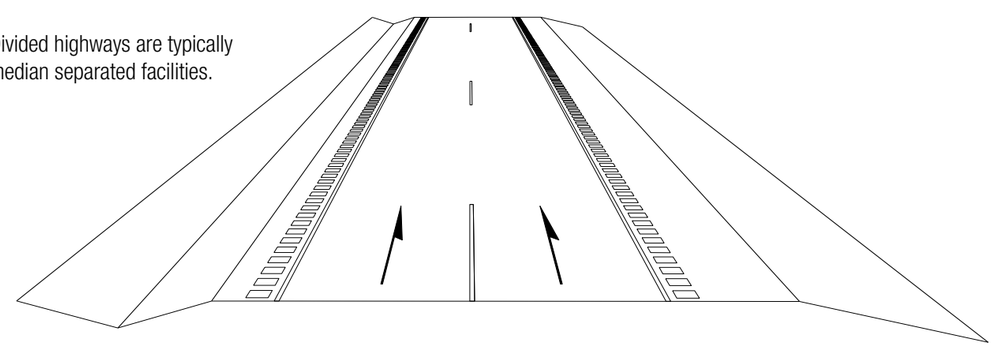
Additionally, 85 miles of non-interstate divided highways have shoulder rumble strips installed.

WSDOT uses milled-in shoulder rumble strips as the standard design. Milled grooves are 16” wide, 7” across, and 1/2” deep.

Run-off-the-road Collisions



This chart represents an analysis of almost 250 miles of divided highways. The analysis evaluated accident experience for one-year prior and one-year after rumble strip installation. It shows a reduction of 13% in all run-off-the-road collisions and 49% in collisions where the driver was inattentive or asleep.



Divided highways are typically median separated facilities.

Shoulder Rumble Strips – Undivided Highways

Because of the success of shoulder rumble strips on the divided highway system, there is a desire to extend the use of shoulder rumble strips to the undivided highway system. Unlike the divided highway system, the shoulders of undivided highways have a higher percentage of users on the shoulder, particularly bicyclists and pedestrians.

Additional consideration is warranted for the use of shoulder rumble strips on the undivided highway system.

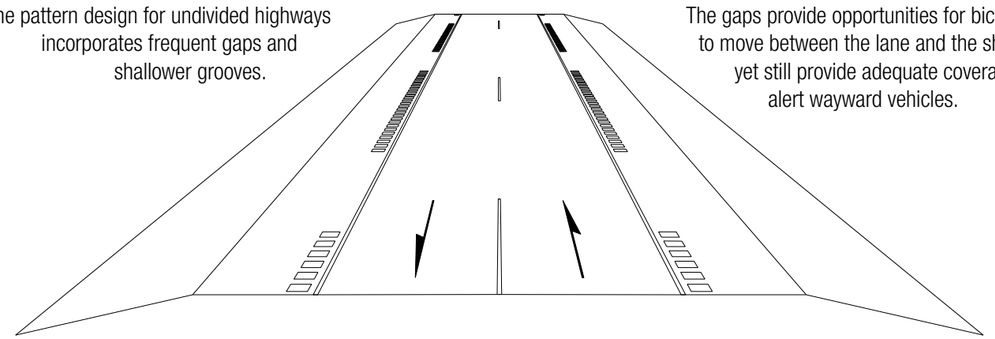
In particular:

- High run-off-the-road crash experience
- Adequate shoulder width to accommodate bicyclists
- Coordination with the WSDOT Bicycle/ Pedestrian Advisory Committee

Installation of shoulder rumble strips on the undivided highway system has been minimal in the past. With policy guidance now in place, this usage is expected to increase.

There have not been sufficient installations in place to analyze the effectiveness.

This photograph illustrates a combined application of shoulder and center line rumble strips.



The pattern design for undivided highways incorporates frequent gaps and shallower grooves.

The gaps provide opportunities for bicyclists to move between the lane and the shoulder, yet still provide adequate coverage to alert wayward vehicles.